

August 6, 1948

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Dear Tracy:

Thank you very much for your letter of July 29. I received just a day ago the draft of your paper from Horowitz. I shall write you in a few days after I have had a little time to digest it.

With respect to Delbruck's idea, I think I know what he is driving at although of course I cannot be sure until I see a firsthand account of the hypothesis he is proposing. You may recall from some of my early papers, of which you probably have copies, that I have fooled around a little with the theory by open systems in steady states, or as Delbruck calls them, "flux equilibria". I have, therefore, a little experience with the properties of such systems and as a matter of fact, about six years ago I tried to use this sort of formulation to explain cellular differentiation. I gave a paper on it at Woods Hole, but never published it. In any case, I think this can be stated.

It seems to me what would be necessary would be to have a system which possesses a set of steady state conditions which are ~~separated~~ operated from each other by a finite interval so that small but finite displacements from any given steady state condition would not lead to a permanent modification, but on the contrary would lead to the return to the condition from which the system was disturbed. External disturbances, however, which exceeded a certain finite critical value would be able to shift the system to a new steady state which would then again be maintained in the face of small disturbances until again a sufficiently large disturbance occurred in the environment. This situation is probably more adequately expressed by an inertia rather than a momentum effect. It turns out that it is very simple to set up models which would possess this kind of stability.

I have just worked out the mathematics for a very simple system involving a single chemical reaction in which two alternative steady state values are possible, and these are separated by a finite interval. It would not be difficult to have any number of possible steady state values.

I shall have to think a little bit more about this before estimating its explanatory value for the situations with which we are both concerned. There are certain difficulties which I think this formulation will encounter but I am not sure that they cannot be overcome. At the present moment I would say quite definitely that the idea is very worthy of consideration and discussion. I am hoping that we will get the opportunity in Washington to go into the matter further. In the meantime, I shall play around a little further with the mathematics of the situation. I don't know how much time I can devote in my talk to a discussion of this problem unless Delbruck is there. It is not easy to discuss another fellow's theory in the absence of a concrete statement of its contents. It is conceivable that my guess as to what Delbruck was driving at is completely incorrect.

By the way, I would appreciate your letting me know as soon as you can what hotel you will stay at, since I would like, if possible, to get reservations in the same place or nearby.

With best regards,

Cordially yours,

S. Spiegelman

SS/bks